



Homework 5 Bitwise manipulation and masks

1. Figure 1 shows a byte containing a signed integer. The value of the carry bit is unknown.

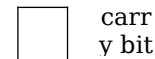
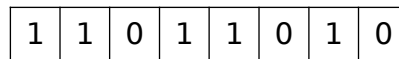


Figure 1

Show the result of performing the following shifts, starting each time with the byte given in Figure 1. [4]

(a) a logical right shift of

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 carry bit

(b) a logical left shift 1:

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(b) an arithmetic left

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 shift 1:

(c) an arithmetic right

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 shift 2:

2. Using a combination of shifts and addition, multiply 17 by 7 [3]

3. Figure 2 shows an 8-bit byte containing a bit pattern controlling 8 lights.

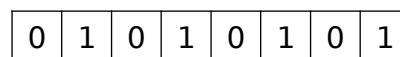


Figure 2

- (a) It is desired to set switches 1- 4 to 0 without altering the other switches. Show how this can be done with a mask and a logical operator. [2]

Switch number	1	2	3	4	5	6	7	8
Current state	1	1	0	1	0	1	1	1

- (b) It is now desired to reset the bits to all 1s, except for bit 8, which should be left as it is. Show how this can be done with a mask and a logical operator. [2]

Switch number	1	2	3	4	5	6	7	8
Current state	0	0	0	0	0	1	1	1



5. The ASCII codes for the uppercase letters A - Z are 0100 0001 to 0101 1010.
The lowercase letters a - z are represented in ASCII by 0110 0001 to 0111 1010.
Use a mask and a logical operator to transform an uppercase letter to lowercase.
[2]

	1	2	3	4	5	6	7	8
code for A	0	1	0	0	0	0	0	1

Total 13 marks